In-situ Structural and Dynamical Characterization of Solid-polymer Melt Interfaces

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The topic of this talk, ultrathin polymer films on solids, has been of vital interest in many traditional technologies as well as in new emerging nanotechnologies such as organic photovoltaics, semiconductor chips, and biosensors. There is now growing evidence that polymer chains irreversibly adsorb even onto weakly attractive solid surfaces, forming several nanometer-thick adsorbed polymer layers ("adsorbed nanolayers"). I present our recent X-ray and neutron scattering results on the structure and dynamics of the adsorbed nanolayers composed of various polymers (amorphous, semicrystalline, and blockpolymers) and their equilibrium pathway/conformation at planar and curved solid surfaces [1-7]. In addition, we found that the effects of the adsorbed nanolayers propagate into the film interior, resulting in long-range perturbations of the local structure/dynamics/property of ultrathin polymer films [1-3]. Furthermore, we have revealed that the adsorbed nanolayers play a vital role in the macroscopic stability of ultrathin polymer films [5]. Finally, I highlight the structure and dynamics of the adsorbed nanolayers formed onto nanoparticle surfaces that play crucial roles in the rheological and mechanical properties of polymer nanocomposites [7].

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